



CO-ORD SWITCH

DIVISION OF LVC INDUSTRIES INC. •

TECHNICAL BULLETIN NO. CO-1464

MATRIX SWITCHES

WHAT ARE MATRIX SWITCHES?

CO-ORD matrix switches (sometimes called "pinboards" or "program boards") provide a simple method of connecting complex networks while maintaining maximum switching flexibility. In basic electrical representation, the matrix switch is a rectangular array of single pole, single throw switches which may have the terminals of the rows of switches bussed. Figure I shows a 3x3 matrix with two variables, X-Y, and bussed contact terminals. Any of the X terminals may be connected to any of the Y terminals by closing the contacts at the coordinate intersection of the respective buss lines (crosspoint). Also, any X terminal may be connected to any other X terminal by closing two crosspoints. By adding a third variable, Z, (Figure II) the number of circuit combinations is greatly increased since any of the terminals in the three decks may be interconnected in any combination. The number of terminals which may be interconnected is further increased when the terminals in the Z plane are not bussed (isolated).

Figure III illustrates the basic simplicity of the CO-ORD contact geometry which has led to the high reliability of the design, even under dry circuit conditions. The rows of parallel conductive strips are retained in dielectric decks, each deck having its strips perpendicular to the strips in the adjacent deck(s), thereby forming the switching matrix. To close a crosspoint a shoring pin is inserted thru the decks. The pin brushes against the strips at the particular crosspoint thereby connecting the desired terminals. In the case where isolated terminals are used in the bottom deck the pin would mate with a female contact in that deck.

The method of schematically representing some typical contact arrangements is shown in Figure IV. Figure IV (a) shows the schematic of Figure I; (b) shows the program of Figure II; (c) shows a five deck "cordless patch panel" with the following crosspoint connections: A3 to C1, B3 to B1, C3 to A1 and A2 to C2.

CO-ORD SWITCH has produced matrices with from 20 to 11,000 crosspoints and having up to five decks. These are available in a wide range of standard sizes (See specifications on reverse side.) and contact configurations, or may be made to meet special requirements. Complex matrices which wed several contact arrangements with different numbers of decks can be produced to meet customer specifications. Where it is desired that auxiliary components such as connectors and pilot lights be installed on the matrix switch panel, CO-ORD will supply the assembly completely wired and ready for operation. For networks where the insertion of components such as diodes, resistors or amplifiers is desired "CO-AX" phone jack type pins are available. Shorting pins for connecting any decks in 3, 4, and 5 deck switches, in any combination, are also available. Panels may be supplied blank or with standard grid markings, or may be coded to meet special needs. Pre-patching accessories and panel templates are available for rapid program changing.

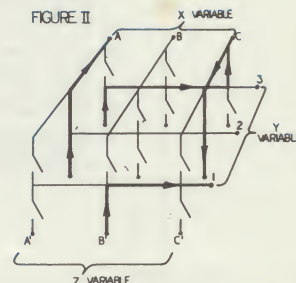
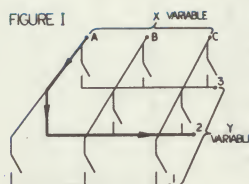


FIGURE III

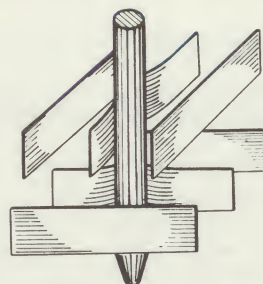
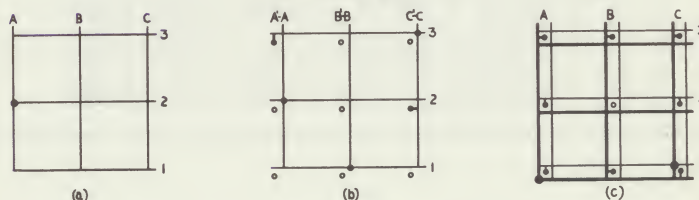


FIGURE IV



WHERE ARE PROGRAM MATRIX SWITCHES USED?

Since CO-ORD matrix switches perform the above functions with a minimum of cost and space, and with a maximum of simplicity, reliability, and flexibility, they have been employed in such applications as:

Computer memories	Cordless patch panels	Switch control centers
Code generators	Data channeling & logging	Thermocouple signal selectors
Communications distributors	Numeric controlled machinery	Traffic control panels
Circuit/Component test programmers	Function generators	Variable sequence selectors
Process programmers	Lighting systems programmers	Power distributors
Breadboard/Kit control panels	Decade switches	Vending machine programmers

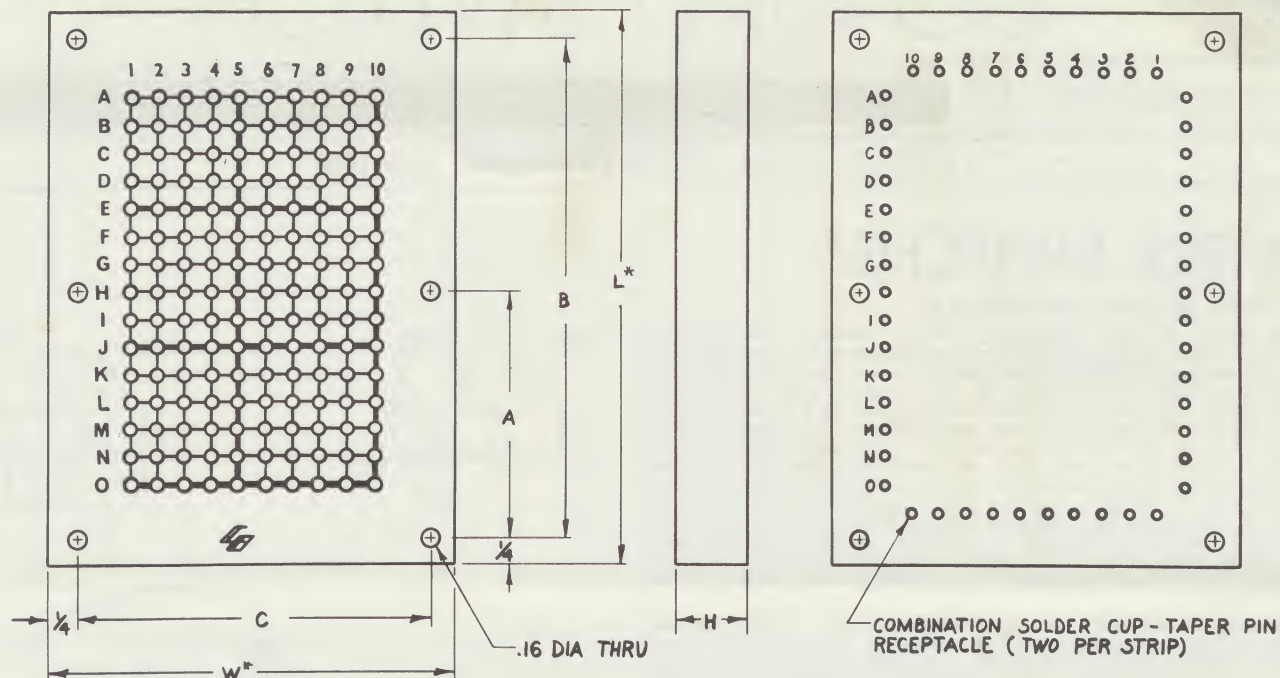
WHY ARE CO-ORD PROGRAM MATRIX SWITCHES USED?

Some reasons why CO-ORD program matrix switches have been selected for a wide variety of applications are:

- Rugged solid phenolic block construction
- High mechanical environment capacity for MIL applications
- Low contact resistance and capacitive "cross talk"
- Low cost
- Attractive and uncluttered panel
- Standard sizes available off the shelf
- Wide variety of switching combinations with standard hardware
- Compact package
- Provides two, three, four, or five dimensional switching
- Permits insertion of components into network without soldering
- Programs may be stored & changed rapidly with grid templates

PATENT APPLIED FOR

STANDARD MATRIX SWITCHES - SERIES 63014



*Mounting flanges may be provided to customer specifications
 $H=3/16(N+1)$; N=Number of decks; add 7/32 clearance for isolated contact deck.

DASH	MATRIX	L	W	A	B	C
-1	10 X 10	3 3/4	3 3/4	-	3.250	3.250
-2	10 X 15	5	3 3/4	-	4.500	3.250
-3	10 X 20	6 1/4	3 3/4	-	5.750	3.250
-4	10 X 25	7 1/2	3 3/4	3.500	7.000	3.250
-5	15 X 20	6 1/4	5	-	5.750	4.500
-6	15 X 25	7 1/2	5	3.500	7.000	4.500
-7	20 X 20	6 1/4	6 1/4	-	5.750	5.750
-8	50 X 10	13 3/4	3 3/4	4.500 8.500	13.250	3.250
-9	25 X 25	7 1/2	7 1/2	3.500	7.000	7.000

SPECIFICATIONS

- 1 - Contact Resistance
 - a-Total Pin Resistance: .004 OHM MAX.
 - b-Volume Resistivity of Strip: .003 OHM/IN
- 2 - Breakdown Voltage: 1000 VRMS MIN.
- 3 - Current Capacity: 5 AMPS Continuous
- 4 - Materials
 - a-Plastic Parts: Black Phenolic
 - b-Flexible Contacts: Heat Treated Beryllium Copper
 - c-Terminals: Brass
 - d-Hardware: Nickel Plated Brass
 - e-Finishes: .003 Silver Over Copper Flash (Standard)
 .003 Nickel Over Copper Flash (Suffix "N")
 .00003 Gold Over .0002 Silver (Suffix "AU")
 .0001 Gold Over .0001 Copper (Suffix "G")**

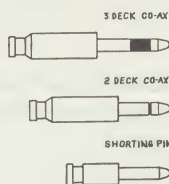
** Hard Gold on Strips; Soft Gold on Pins

PROGRAMMING PINS

Two standard pins are used with CO-ORD matrix switches - a basic shorting pin and a CO-AX component pin. The shorting pin is used to join any two circuits in the contact decks. The CO-AX pin is used to isolate circuits, providing an electrical connection between decks to a component installed in the handle of the pin. Diodes, resistors, bulbs or other components can be used and the handles may be color coded.

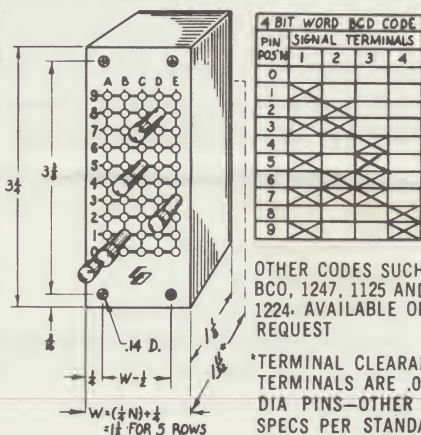
Specifications:

- 1 - Pin, brass, .106 dia.
- 2 - Handle, nylon.
- 3 - Insulator (CO-AX pin), teflon.
- 4 - Plating, gold, silver, nickel.
- 5 - Component (max.size), .375 lgth., .160 dia., .025 dia. wire.



COMPUTER-CODED OUTPUT SWITCHES

Series 63030 switches offer a wide variety of binary-coded outputs within a compact package. Low contact resistance for dry circuit conditions is a standard feature. The pin is a three-dimensional position indicator which is easiest to read, regardless of the viewing angle. Any number of decades may be built into a single attractive package which may be either front or back mounted. Applications include: EDP systems, Test equipment, Automation systems, GSE equipment and Servo systems.



OTHER CODES SUCH AS BCD, 1247, 1125 AND 1224. AVAILABLE ON REQUEST

*TERMINAL CLEARANCE TERMINALS ARE .040 DIA PINS-OTHER SPECS PER STANDARD MATRIX SWITCHES

In addition to the standard products listed on this page, CO-ORD Switch produces many types of special purpose switching devices to customer specifications. These include: Multi channel cyclical programmers, Timers, Stepping switches, Selectors, Tape and card readers, Crossbar switches, and Scanners. Our applications have ranged from vending machine timers to supersonic wind tunnel switch centers. Production quantities have varied from 1 to 10,000. We can therefore offer a broad design and manufacturing background in aiding you to make your switching ideas become functioning hardware. Please contact us for more information on how CO-ORD Switch can assist you in your particular application.



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DIVISION OF LVC INDUSTRIES INC. •

102-48 43RD AVENUE • CORONA, N. Y. 11368 • 212-899-5588

(212) 899-5588



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June 8, 1966 EP 3/66

Mr. T. Nelson, Sys Consultant
Box 1546
Poughkeepsie, N.Y. 12603

Dear Sir:

Thank you for your inquiry requesting further information on CO-ORD SWITCH capabilities.

The literature that you requested is enclosed. We hope that it will aid you in your particular application. If, however, you require any further information please do not hesitate to contact us. We will be most happy to offer any engineering assistance necessary to facilitate and optimize your use of CO-ORD switching products.

I hope that we may soon have the opportunity of serving you further.

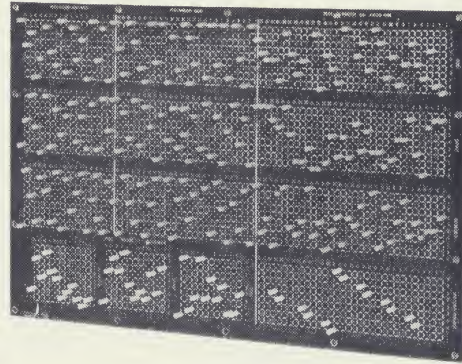
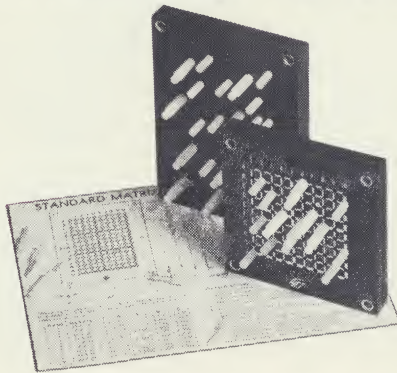
Very truly yours,

CO-ORD Switch Division
LVC Industries Inc.

**CO-ORD SWITCH**

A DIVISION OF LVC INDUSTRIES INC.

102-48 43rd AVE., CORONA, N. Y. 11368 • TEL: 212-899-5588

MATRIX PROGRAM BOARDS

CO-ORD Matrix Program Boards are composed of 2 to 6 decks of contacts that are bussed in parallel rows on .250 centers. The contact rows of one deck are usually oriented perpendicular to the rows of adjacent deck(s) so as to obtain switching crosspoints. Electrical connections of the bussed contact rows are effected by inserting shorting pins at the desired crosspoints; "CO-AX", phone plug type pins are available for networks which require component insertion (Diodes, resistors, etc.). Single board matrices of up to 11,000 crosspoints are available in standard or special arrangements. Bussed and isolated contacts can be had alone or in combination. Panels may be screened, engraved, or fitted with pre-punched templates for rapid program changing.

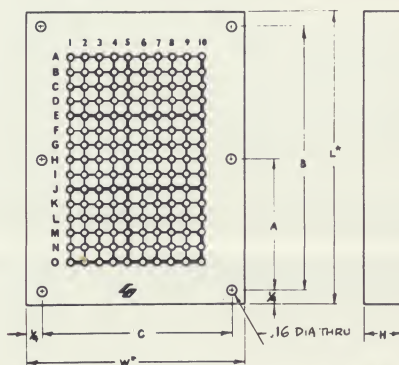
FEATURES

- Closed entry contacts
- High mechanical environment capacity for MIL applications
- Low interlead capacitance (cross-talk) for high frequency applications
- Attractive and uncluttered panel
- Compact package
- Standard sizes available off the shelf
- Permits insertion of components into network without soldering
- Wide variety of switching combinations available using standard hardware

APPLICATIONS

Computer memories
Cordless patch panels
Function generators (Analog/Digital)
Power distributors
Thermocouple signal selectors
Circuit/Component test programmers
Lighting systems (Special effects)
Variable sequence selectors

Variable diode matrices
Code generators
Traffic control panels
Decade switches
Vending machine control
Numeric controlled machinery
Data channeling & logging
Communications distributors

STANDARD MATRIX BOARDS — SERIES 63014**SPECIFICATIONS**

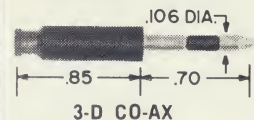
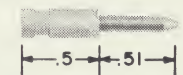
- 1-Contact Resistance
a Total Pin Resistance:
.004 OHM MAX.
b Volume Resistivity of
Strip: .003 OHM/IN
- 2-Breakdown Voltage:
1000 VRMS MIN.
- 3-Current Capacity:
5 AMPS Continuous

4-Materials

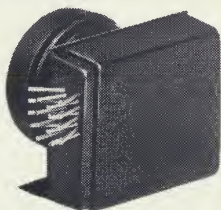
- a Plastic Parts: Black Phenolic XXX
b Flexible Contacts: Heat Treated Beryl. Copper
c Terminals: Brass
d Finishes: Gold, Silver or Nickel

DASH	MATRIX	L	W	A	B	C
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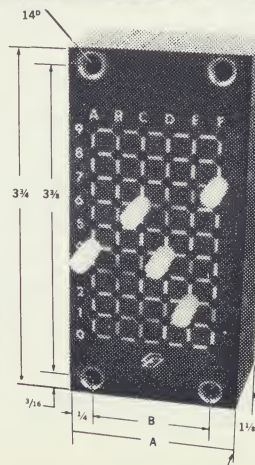
H	2-D	3-D	4-D	5-D	6-D
	3/16	3/4	1 1/16	1 1/8	1 3/16

PROGRAM PINS**3-D CO-AX****2-D CO-AX****2-D SHORTING PIN**
Pins up to 6 deck available**SPECIAL PROGRAMMING DEVICES AND SYSTEMS**

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PIN POS'N	4 BIT WORD BCD CODE			
	SIGNAL TERMINALS			
	1	2	4	8
0				
1				
2				
3				
4				
5				
6				
7				
8				
9				

TERMINALS ARE .040 DIA. PINS — OTHER SPECS PER STANDARD MATRIX.

OTHER CODES SUCH AS BCO, 1247, 1125 AND 1224 AVAILABLE ON REQUEST.

FOR MORE DETAILS AND PRICE INFORMATION ON OUR COMPLETE PRODUCT LINE CONTACT US DIRECT OR YOUR LOCAL REP.